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Superseding
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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

CABLE, CONTROL, TWENTY-FIVE PAIRS, INTERIOR

1. SCOPE

1.1 Scope.- This specification covers requirements for 25 pair communication type cable having No. 22 AWG stranded conductors, thermoplastic insulation and thermoplastic jacket. This cable will be used for interior communication and control applications. One type is considered under this specification: 25 pairs, 7 by 30 stranded tinned conductor, overall shield and with polyvinyl chloride insulation and jacket.

2. APPLICABLE DOCUMENTS

2.1 American Society for Testing and Materials Standards

B 286	Copper Conductors for Use in Hookup Wire for Electronic Equipment
D 470	Methods of Testing Rubber and Thermoplastic Insulated Wire and Cable
D 2287	Nonrigid Vinyl Chloride Compounds
D 1047	Polyvinyl Chloride Jacket Compound for Electrical Insulated Cords and Cables

2.2 Insulated Cable Engineers Association Specification

S-56-434	Polyethylene Insulated, Thermoplastic-Jacketed Communication Cable

2.3 National Electrical Manufacturers Association Standards

WC-21	Non-returnable Reels for Wire and Cable

2.4 Precedence.- In the event of a conflict between the above-mentioned standards and this specification, this specfication shall govern. Specifications are referred to by basic number and title; the issue in effect on the date of invitation for bids shall apply.

Copies of this specification may be obtained from the Contracting Officer in the Federal Aviation Administration Office issuing the invitation for bids or request for proposals. Requests should fully identify material desired, i.e., specification and amendment numbers and dates. Request should cite the invitation for bids, request for proposals, or the contract involved or other use to be made of the requested material.

Information on obtaining copies of ASTM Standards may be obtained from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

Information on obtaining copies of ICEA Standards may be obtained from Insulated Cable Engineers Association, P.O. Box P, South Yarmouth, MA 02664.

Information on obtaining copies of NEMA Standards may be obtained from National Electrical Manufacturers Association, 155 East 44th Street, New York, New York 10017.

3. REQUIREMENTS

3.1 Materials.- Materials shall be as specified herein. When materials are used which are not specifically designated, they shall be entirely suitable for the purpose. The manufacturer shall be prepared to show proof that insulation and jacket were made from virgin compounds.

3.2 Workmanship.- Cable shall be manufactured and processed in a careful and workmanshiplike manner in accordance with good design and high grade manufacturing practices. The cable shall be free of any imperfections which may affect its serviceability.

3.3 Design and construction.- The finished cable shall be substantially circular in cross section.

3.3.1 Conductors

3.3.1.1 Size.- Each conductor in the cable shall be 7 by 30 stranded tinned copper, with a lay conforming to ASTM B 286.

3.3.1.2 Materials.- The conductors shall be soft drawn or annealed copper and meet the requirements of ASTM B 286.

3.3.1.2 Conductor joints.- Joints made in conductors during the manufacturing process may be brazed, using a silver alloy and nonacid flux; or they may be welded. Conductor joints shall be free from lumps and sharp projections. The tensile strength of any section of a conductor having a factory joint shall be not less than 85 percent of the tensile strength of an adjacent section of the conductor without a joint.

3.3.2 Insulation.- Insulation shall be a nominally 0.014 inch wall of polyvinyl chloride compound conforming to requirements of ASTM D 2287, Cell Designation 6-0-6-3-3-E1-X1. Insulation concentricity shall be maintained so that a minimum wall shall not be less than 70 percent of the maximum wall thickness. The minimum wall at any point shall not be less than 90 percent of the nominal.

3.3.2.1 Repairs.- Repairs to conductor insulation is permitted, using heat fusing and insulation grade compound.

3.3.2.2 Color coding.- Conductor insulation shall be color coded in accordance with the requirements for "Paired Construction," ICEA Publication S-56-434. Colors shall be compounded in the insulation material.

3.3.3 Cabling.- The cable is to be made up of twisted pairs having a lay of 1½ to 2½ inches per pair. A shield and drain wire shall be provided as specified in paragraph 3.4 and paragraph 3.4.1. The cable core may be bound with non-hygroscopic threads if desired for manufacturing reasons.

3.3.3.1 Lay of groups.- The groups (twisted pairs) shall be cabled with an 8 to 10 inch lay in either the same or in the reverse direction of the lay of the individual pairs.

3.4 Shielding.- A tape shield shall be applied over the cabled conductors. The shield shall be a layer constructed tape consisting of a minimum of .001 inch thick polyester, cemented to aluminum foil of a minimum of .001 inch thickness. If desired, the tape's cement or adhesive may be colored.

3.4.1 Drain wire.- An uninsulated, tinned, stranded 7 by 30 drain wire shall be included over the shield.

3.4.2 Shield and drain wire application.- The shield shall be applied spirally with the aluminum foil facing outward. The shield coverage of the cabled conductors shall be complete plus a 3/16 inch minimum lap. There shall be no exposed areas of conductors when the shielded core is coiled around a mandrell six times the shielded core diameter. The drain wire shall be placed over the shield and shall be in continuous contact therewith.

3.4.3 Cable identification.- All cables shall be provided with a marker tape laid under the jacket, under the shield, or under the core covering. The tape shall be not less than 1/8 inch wide and containing on one side the following printed information at intervals of approximately 1 foot:

(a) Name of manufacturer
(b) Type of cable
(c) FAA contract number
(d) Footage marker to indicate total footage of cable to each mark. This marker tape will be used to check footage of cable as desired, but it will not be used for test or payment purposes.

3.5 Jacket.- A polyvinyl chloride jacket shall be applied overall. Jacket wall thickness shall be nominally 0.040 inch. The average thickness at any cross section shall not be less than 90 percent of the nominal thickness. The minimum spot thickness shall not be less than 70 percent of te nominal thickness. Jacket material shall comply with ASTM D 1047. The jacket shall be colored yellow throughout.

3.5.1 Rip cord.- A rip cord of suitable material shall be laid longitudinally over the core to facilitate removal of the jacket.

3.5.2 Jacket repairs.- Opening of the cable jacket for repair or for any other purpose will not be permitted. Minor jacket defects not in excess of 0.25 inches in size in any direction may be repaired by using heat fusing and jacket grade compound.

4. SAMPLING, INSPECTION AND TEST PROCECURES

4.1 General.- Inspection will be performed on this cable by the contractor and witnessed by a Government representative unless waived in whole or in part by the Contracting Officer. If Government witnessed testing is waived, the contractor shall furnish, in lieu thereof, certified test data showing compliance with the specification requirements. Only one inspection will be required and will be performed at the time the cable is completely manufactured. An reel of cable offered for inspection but failing to meet the requirements of the tests for the inspection may not be reoffered for a retest without the approval of the Contracting Officer.

The following tests shall be performed:

Electronic Tests	Paragraph
Spark Test	4.2.1
Dielectric Test	4.2.2
Insulation Resistance	4.2.3
Conductor Resistance	4.2.4
Grounds and Faults	4.2.5
Shield Test	4.2.6

	Physical Tests	Paragraph	*Insulation	*Jacket
	Insulation Thickness	4.3.1.1	X	
	Tensile and Elongation	4.3.1.2	X	X
	Jacket Thickness	4.3.1.3		X
	Cold Test and Brittle Temperature	4.3.1.4	X	X
	Heat Shock	4.3.1.5		X
*	Flammability and Flame Retardant	4.3.1.6	X	X
	Oil Immersion	4.3.1.7		X

*Where test samples of the size necessary for conformance to ASTM D 1047 or D 2287 are required, factory furnished samples from material being used on the order may be substituted.

4.2 Electrical tests

4.2.1 Spark test.- Prior to twisting into pairs, a spark test shall be made on each conductor length. The spark test shall be 3 KV AC or 4.2 KV DC maintained within plus or minus 5 percent (except during actual sparkover). The insulated conductor shall pass through the electrode at a speed that will cause the insulation to be subjected to the test voltage for a period of time not less than 0.2 second. Factory certification that the conductors conformed to provisions of the spark test will be acceptable.

4.2.1.1 Failure during spark test.- All insulation failures in excess of one per 4,000 feet of conductor shall be repaired. Repairs shall be made with insulation grade compound and heat fusing.

4.2.2 Dielectric test.- Each length of cable shall have a high potential test at 2,000 volts alternating current or 2,800 volts direct current for a period of a minimum of three seconds. The test shall be made between one half of the conductors, and the other half connected to the shield. Group testing of all pairs at one time may be performed.

Failure of ten percent or more of the lot of cable being inspected shall be cause for rejection of the entire lot.

4.2.3 Insulation resistance.- Insulation resistance shall be measured with all other conductors and shield grounded. Minimum acceptable resistance shall be 500 megohms per 1,000 feet. Tests shall be performed on a minimum of two pair from the first 2,000 feet of completed cable on order and on a minimum of two pair from a 2,000 foot length from each 50,000 feet of

or fraction thereof, on the order. The insulation resistance shall be measured with a DC potential of not less than 100 nor more than 500 volts, applied for not more than one minute.

4.2.4 Conductor resistance.- Not less that two pair from each 2,000 feet of cable on order shall be tested. The DC resistance, corrected to 20° C, shall not exceed 17.6 ohms per 1,000 feet.

4.2.5 Grounds and faults.- Each length of cable shall be free from grounds (contacts between a conductor and the shield), open circuits, crosses, and short circuits.

4.2.6 Shield test.- The shield on all lengths of cable shall be tested for continuity.

4.3 Physical tests

4.3.1 Samples.- Samples for testing shall be taken from the first 2,000 feet and from each 50,000 feet of cable on the order. The number of samples shall be in accordance with ASTM D 470.

4.3.1.1 Insulation thickness.- The wall thickness shall comply with paragraph 3.3.2.

4.3.1.2 Tensile and elongation test.- The insulation and jacket shall comply with requirements of ASTM D 2287 or D 1047, whichever is applicable.

4.3.1.3 Jacket thickness.- The cable shall comply with paragraph 3.5.

4.3.1.4 Cold and brittle temperature test.- The insulation and jacket shall be tested for conformance to ASTM D 2287 or D 1047, as applicable.

4.3.1.5 Heat shock test.- The jacket shall be tested for conformance to ASTM D 1047.

4.3.1.6 Flammability and flame retardant test.- The insulation and jacket shall be tested for conformance to ASTM D 2287 or D 1047, as applicable.

4.3.1.7 Oil immersion test.- The jacket shall be tested for conformance to ASTM D 1047.

4.4 Sampling

4.4.1 Referee samples.- When so stated in the invitation for bids or when later requested by the inspector, in writing, samples of the completed cable shall be supplied to a testing laboratory selected by the Contracting Officer. Such samples shall be not less than 10 feet long and shall be selected on the basis of one sample for the first 25,000 feet or fraction thereof, and one for each additional 50,000 feet or fraction thereof.

5. PREPARATION FOR DELIVERY

5.1 General.- Cable shall be delivered on nonreturnable reels. The cable shall be in one continuous length for each reel.

5.1.1 Reel construction.- Cable shall be delivered on reels complying with NEMA Standard WC-21, Table I for Wood Reels. All reels shall be lagged with a minimum of 2 inch by 4 inch standard lumber, lagging pieces to be edge-to-edge around circumference and strapped with two or more steel straps outside of lagging. The cable shall be suitably encased with both cable ends exposed so that tests may be made without unreeling. The cable ends shall be effectively sealed to prevent the entrance of moisture during storage and shipment. When reel and cable weigh more than 1,500 pounds, a metal reel center shall be provided through which an axle may be passed to facilitate handling.

5.2 Marking

5.2.1 Reels.- Unless otherwise specified, each reel shall be plainly marked on both flanges with the manufacturer's name, the contract and the order numbers, the quantity, size and type of the cable on the reel, the NSN and the name and address of the consignee. Markings shall be made with permanent type ink or paint.

6. NOTES

6.1 Note on information items.- The subparagraphs below are only for the information of the Contracting Officer, intended to assist him in formulating a contract. They are not contract requirements, nor binding on either the Government or the contractor, except to the extent that they may be specified elsewhere in the contract as such. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

6.2 Cable lengths.- Procurement provisions should include requirements of cable per reel with suitable tolerances per reel and for the total amount delivered.

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